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10/511,683	10/19/2004	Noboru Yamamoto	121552	4828

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EXAMINER	
NGUYEN, THUONG	
ART UNIT	PAPER NUMBER
2155	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/511,683	YAMAMOTO, NOBORU	
	Examiner	Art Unit	
	Thuong (Tina) T. Nguyen	2155	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *26 August 2008*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *5-9 and 11* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *5-9, 11* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. This action is in response to application 10/511,683 filed 2/5/08. Claims 5-9 & 11 are pending and represent method for parallel merge/sort processing device, method, and program for sorting data strings.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claims 5 & 11 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. It's unclear to the examiner what the arbitrary algorithm is? And how does it work?

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims 5-6, & 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Arakawa, Patent No. 2002/0065793 in view of Rosner, Patent No. 2004/0221138 A1.

Arakawa teaches the invention substantially as claimed including sorting system and method executed by plural computers for sorting and distributing data to selected output nodes (see abstract).

6. As to claim 5, Arakawa discloses a method for performing parallel sorting processing using a parallel processor comprising:

if the input is one unsorted data string, a first step of dividing the unsorted data string to generate a plurality of unsorted partial data strings (page 1, paragraph 6; page 3, paragraph 50; Arakawa discloses that the method of dividing the data into the buffer to perform internal sorting);

a second step of assigning a processor to said plurality of partial data strings respectively (page 1, paragraph 9; page 4, paragraph 56; Arakawa discloses that the method of distributed and assigned data among plurality of computers);

a third step of sorting each of said plurality of partial data strings independently by the assigned processor based on an arbitrary algorithm, to generate sorted partial data strings, the plurality of unsorted partial data strings being sorted each in one of either ascending or descending order (page 1, paragraph 4; Arakawa discloses the method of sorting data into certain order such as ascending or descending order);

a seventh step of performing merge processing by the assigned processor and outputting sorted partial data strings (page 1, paragraph 10; page 5, paragraph 73; Arakawa discloses that the method of performing merge processing); and

a step of repeating said fourth step to said seventh step using the merge-processed sorted partial data strings as said sorted partial data strings, wherein the above steps are applied when one unsorted data string is provided, and the first to the third steps are unnecessary if two or more sorted data strings are provided, and a repeat of said fourth to seventh steps ends in the stage when the merge-processed sorted partial data strings are merged into one data string (page 3, paragraph 50; page 10, paragraph 127; Arakawa discloses that the method of repeating the steps until output one merge data string);

If two sorted data strings are provided, the fourth to seventh steps are executed only once, and a repeat is not required (page 3, paragraph 50; page 6, paragraph 77; Arakawa discloses that the method of checking to see if the data is unsorted or sorted and process accordingly).

But Arakawa failed to teach the claim limitation wherein a fourth step of creating an input data string pair for sorting using arbitrary two sorted partial data strings which were acquired in the third step or the seventh step or was input as initial data, and dividing the pair into required number of sets of partial data string pairs respectively under a predetermined division condition; a fifth step of editing job information for parallel processing of merge processing, the control information for parallel sorting of the plurality of divided partial data string pairs; a sixth step of assigning to the plurality of

divided partial data string pairs a processor group for merging of the plurality of divided partial data string pairs.

However, Rosner teaches reordering in a system with parallel processing flows (see abstract). Rosner teaches the limitation wherein a fourth step of creating an input data string pair for sorting using arbitrary two sorted partial data strings which were acquired in the third step or the seventh step or was input as initial data, and dividing the pair into required number of sets of partial data string pairs respectively under a predetermined division condition (page 2, paragraph 15); a fifth step of editing job information for parallel processing of merge processing, the control information for parallel sorting of the plurality of divided partial data string pairs (page 1, paragraph 12); a sixth step of assigning to the plurality of divided partial data string pairs a processor group for merging of the plurality of divided partial data string pairs (page 1, paragraph 12)).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Arakawa in view of Rosner so that the system would be able to performed the merging or sorting much faster using multiple processing technique. One would be motivated to do so to reduce the power consumption, shorter development time and less difficult validation of the functionality.

7. As to claim 6, Arakawa and Rosner disclosed a method as recited in claim 5 wherein two processors are assigned to said partial data string pair in said sixth step, and the job control information relating to parallel processing of merge processing is edited in the fifth step so that a first processor performs merge processing in

descending order from a side of which a key value is greater in said partial data string and a second processor performs merge processing in ascending order from an edge of which a key value is smaller in the same partial data string simultaneously in said seventh step (page 1, paragraph 4; page 4, paragraph 59; Arakawa discloses the method of assigning the key value to perform the sorting in certain order).

8. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Arakawa, Patent No. 2002/0065793 in view of Rosner, Patent No. 2004/0221138 A1, and further in view of Graunke, Patent No. 5,852,826.

Arakawa teaches the invention substantially as claimed including sorting system and method executed by plural computers for sorting and distributing data to selected output nodes (see abstract).

9. As to claim 7, Arakawa and Rosner disclosed the parallel sorting processing method as recited in claim 5. But Arakawa and Rosner failed to teach the claim limitation wherein the following items are satisfied as the division condition in said fourth step,

wherein when a data string pair (D_1, n) and (D_2, n) are divided into two partial data string pairs {(D_{11}, n_{11}), (D_{21}, n_{21})} and {(D_{12}, n_{12}), (D_{22}, n_{22})} is established, and also

$n_{11}+n_{21}=2x$, $n_{12}+n_{22}=2(n-x)$

is established, where x is a half value of the number of data of the partial data string pair {(D_{11}, n_{11}), (D_{21}, n_{21})}, and is also the number of data of D_{11} and D_{21} when $n_{11}=n_{21}$.

However, Graunke teaches parallel merge sort method and apparatus (see abstract). Graunke teaches the limitation wherein when a data string pair (D_1, n) and (D_2, n) are divided into two partial data string pairs {(D_{11}, n_{11}), (D_{21}, n_{21})} and {(D_{12}, n_{12}), (D_{22}, n_{22})} is established, and also

$n_{11}+n_{21}=2x$, $n_{12}+n_{22}=2(n-x)$

is established, where x is a half value of the number of data of the partial data string pair {(D_{11}, n_{11}), (D_{21}, n_{21})}, and is also the number of data of D_{11} and D_{21} when $n_{11}=n_{21}$ (figure 4).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the combination of Arakawa and Rosner in view of Graunke so that maximized the user of multiple processes to sort data. One would be motivated to do so to split the data logically into predetermined groups to perform the sort-merge in a faster technique.

10. Claim 11 is a computer readable medium claim and do not teach or define any new limitations above claim 5 and therefore are rejected for similar reasons.

Allowable Subject Matter

11. Claims 8 or 9 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is an examiner's statement of reasons for objected the claims :

In interpreting the claims, in light of the specification and the applicant's arguments filed on 8/19/08, the Examiner finds the claimed invention to be patentably distinct form the prior art of record.

12. Arakawa et al. (US 2002/0065793 A1), teach sorting system and method executed by plural computers for sorting and distributing data to selected output nodes wherein divides the input data and writes each division data into the buffer to perform internal sorting and obtain the sorted result which will repeated as many times as the number of input data divisions and will merge the inputs until output is one data string (abstract; page 1, paragraph 6; page 3, paragraph 50).

13. Rosner et al. (US 2004/0221138 A1), teach reordering in a system with parallel processing flows, wherein divided sequential instruction sequence and divide into segments and assign each segment to PPU tag segment and distributed segments to parallel processing units (abstract; figure 4).

The following is an examiner's statement of reasons for objected the claims to be allowed:

The examiner has found that the prior art of record does not appear to teach or suggest or render obvious the claimed limitations in combination with the specific added

limitations as recited in dependent claims. The prior art of record fails to teach or suggest individually or in combination of "(1) an operation to divide a sorted data string pair {(DI, n), (D2, n)} into k sets of segment pairs, which is equivalent to performing (k-1) sets of two-division operations in which a total of the number of data counted from a first part of Di and D2 becomes 2x with j changing a value of x, while considering a magnitude of the key values of both data strings; in this case, a sub-division problem of the sorted data string pair {(Di, n), (D2, n)} to the k sets of segment pairs is replaced with the above-mentioned two-division problem of the data string that satisfies the items as the division condition in the fourth step; (2) specifying a data position in the data string by an index value, the value sequentially increments with the index value of a first data in the data string D1 orD2 as 0, x indicates the number of data, but if the value of x itself is regarded as an index value, then [x] indicates the (x+l)th data counted as 1,2, 3,... from the first part of the data string; if nil = n21, then nil = nzl = x, which is a formula indicating the number of data, can be interpreted that the position of the xth data counted from the first part, that is data with the index value x-l, is at a division boundary of Di and D2; (3) an area dividing function, comprising: a step of setting said x as an initial value of a boundary index value for index variables i and j for specifying individual data in said data strings Di and D2; a comparison step of comparing a key value of data indicated by the index variable i of the data string D j and a key value of data indicated by the index variable j of the data string D2; a step of adding 1 to an index variable of the data with a greater key value, subtracting 1 from an index variable of the data with a smaller key value, then branching processing to said comparison step, if the key value

of the data indicated by the index variable i of DI and the key value of the data indicated by the index variable j of D2 are not the same in an initial comparison; a step of adding 1 to the index variable of data with a greater key value, and subtracting 1 from the index variable of data with a smaller key value, then branching processing to said comparison step, if a magnitude relationship of the key value of data indicated by the index variable i of D l and the key value of data indicated by the index variable j of D2 is unchanged in a second or later comparison; a step of regarding the data indicated by the index variable i and the data indicated by the index variable j as a division boundary respectively, if the key value of the data indicated by the index variable i of D i and the key value of the data indicated by the index variable j of D2 are the same in the initial comparison; and a step of comparing a greater one of the key value of D1 and the key value of D2 in a previous comparison operation with the greater one of the key value of D I and the key value of D2 in a current comparison operation, and regarding the data with a smaller key value as the division boundary and regarding the data initially compared with this data as the other boundary, if the magnitude relationship between the key value of the data indicated by the index variable i of Dl and the key value of the data indicated by the index variable j of D2 is inverted from a previous magnitude relationship. Claims 8 or 9 are object to be allowed because of the combination of other limitations and the limitation listed above.

Contact Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tina Nguyen whose telephone number is 571-272-3864, and the fax number is 571-273-3864. The examiner can normally be reached on 8:00 AM-5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Saleh Najjar can be reached on 571-272-4006. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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